ISKRAEMECO

Energy Measurement and Management

P2G

Communicator & Data Logger
with internal GSM modem

Technical Description

Version 1.0, 24.1. 2005

Index:

P2G Data logger with internal GSM modem and safety isolation for use with gas and water meters

P2G is an integrated data logger, GSM modem and safety isolation unit in a single device. The internal GSM modem provides a reliable means to communicate data by SMS messages as a part of an AMR, energy management or monitoring system for industrial gas and water metering. P2G belongs to a new generation of Iskraemeco professional communicators based on integrated intelligent i2-GSM™ modem technology developed by Iskraemeco. The unit is approved and manufactured in compliance with the BS EN 60079 and ISO 9001 and designed conforming to Iskraemeco's own stringent internal standards derived from extensive field and manufacturing experience.

Main features of P2G:

- **Inputs:**
    - Up to four intrinsically safe impulse inputs capable of detecting the transitions between the open and closed states of single-pole volt free contacts
    - RS485 input providing interface to devices without a pulse output
- **Outputs:** up to four intrinsically safe outputs providing isolation between the hazardous and safe area
- **Data logger:**
    - Recording of accumulated or differential pulse values for each input channel
    - Temperature logging
    - Event logging
- **GSM communication module:**
    - AMR oriented communication interface via SMS
    - Configurable scheduled delivery of data to the customer's information system
    - On demand data requests
    - Automatic alarm and error message generation
    - Remote configuration of the unit
- **Bi-directional infrared optical port** for local read-out of the load profile and configuration
- **Real-Time Clock** synchronised to GSM network
- **Battery operation** incorporating intelligent power management
- **ATEX certified** for application in zone 0 area
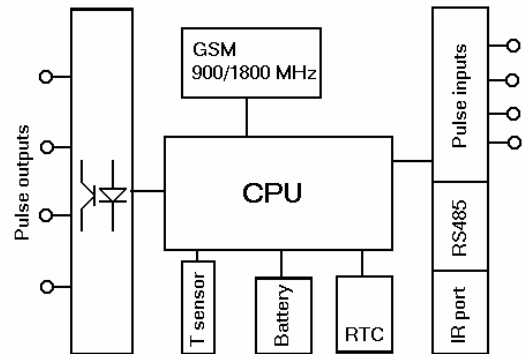
1. Block diagram

Fig 1. Block diagram of the P2G unit

2. Low-frequency inputs and outputs

2.1. Pulse inputs

The P2G features a maximum of four intrinsically safe impulse inputs for direct interface with up to four meters or pulse correctors.
Volt-free reed switch or solid-state pulse type inputs are accepted (see technical data for the required contact closure resistance).
Pulse counting is performed concurrently on all four inputs at a maximum frequency of 10 Hz.
Inputs channels can also be configured for the detection of sporadic contact closures e.g. to be used for the connection of tamper circuits.
Any input channel can be programmed to be associated with any one of the four isolated output circuits. Additionally, port 1 may be linked to all of the four output ports as specified by IGE/GM/7.

2.2. Pulse outputs

The P2G safely isolates pulses from meters installed in the hazardous area to the safe area.
It provides up to four intrinsically safe volt-free output contacts for the connection of other devices utilising the meter output pulses.
Each output contact is capable of sourcing 2mA from a voltage source of to 32V.

2.3. RS485 interface

The built-in RS485 data port allows connection with other compatible external devices, which do not have a pulse output capability.

3. Data logger

3.1. Data logging

The P2G stores accumulated pulse totals for each input in on-board non-volatile memory. Concurrently, raw pulse count values are converted to volumetric values by means of a pulse conversion ratio. Both raw and converted values are stored simultaneously for each input. Each input has an individual pulse conversion ratio.

The logging interval may be configured between 5, 15, 30, 60 minutes or 24 hours and the data storage method tailored to ensure the most efficient use of available measurement memory.

The logging capacity of the unit is dependent upon the number of input ports (including the temperature logging channel), the logging interval, the maximum interval size and whether absolute or differential interval values are to be stored.

The logging capacity expressed days is available at all times through the optical port or by SMS. Up to 128Kb of non-volatile storage is available for measurement data. Typically, the storage capacity exceeds 50 days of 30-minute data per channel in a 4 channel configuration or 50 days of 5-minute data in a 2 channel configuration.

Additionally, ambient temperature logging may also be configured and operates according to the current logging interval.

3.2. Event logging

A comprehensive list of performance and status statistics are logged by the P2G continually. Many logged events may be configured to prompt automatic alarm or error notification by SMS message.

Available information includes:

- GSM network performance and status
- SMS messaging performance information
- Battery status
- Tampering
- User session statistics

4. AMR communication interface

4.1. GSM modem

The P2G features an integrated GSM, dual band 900/1800 MHz modem for a remote transmission of the current readings of the four channels.

The modem is equipped with a high performance internal antenna. In case of a low RF signal on site, the unit can be fitted with an external aerial.

The P2G may be pre-installed with a preferred network operator's SIM card or installed during on site commissioning.

Each transmission in progress will be indicated by a blinking light-emitting diode (SMS Status) on the front of the P2G unit.

4.2. Scheduled data transmissions

Up to 8 schedules may be configured to automatically deliver measurement or performance data periodically by SMS. Every schedule has its own associated start and optional start date, delivery time and interval. Intervals may be specified in months or days or a combination.

Any number of data items may be delivered by a scheduled spread across multiple SMS messages, limited only by internal buffering. For example, one schedule may deliver a daily log while a second schedule delivers billing information on a monthly basis. The minimum interval is a day.

The P2G is a register based system allowing flexible and efficient transfer of data and configuration to and from the remote system by SMS. The unit also features a transport mechanism aiding timely and reliable delivery of SMS messages. Defined SMS messages types are CONFIG, DATA, REQUEST, REPLY, ALARM and ERROR.

The contents of the DATA messages is configurable, the length of a DATA message being limited to 128 octets. A typical DATA message contains the identification parameters of the P2G unit and of the monitored meters, the current readings of the pulse inputs and the date and time information.

The P2G implements a special retry strategy in order to guarantee the delivery of the SMS messages. The total number of delivery attempts, successful deliveries and delivery failures is recorded in statistical registers of the unit.

4.3. Ad-hoc data requests

Any register may be remotely retrieved by means of REQUEST and REPLY messages independently of any active schedules. The requested data can be split over multiple REPLY messages, if necessary.

Due to the restrictions of operating on battery power, incoming SMS messages are processed either, a) when an active schedule causes a power-up to communications mode for delivery, or b) when a configurable wake-up window becomes active.

A wake-up window is a special type of schedule which forces the P2G to power-up to full communications mode to service any pending messages. The start and stop date, time, interval and alive period (expressed in minutes) are configurable. Note: ill-configured wake-up windows may severely limit battery life.

4.4. Alarms and error messages

An ALARM message will be sent by P2G to the customer management system to indicate that an alarm condition exists.

The P2G will send an ERROR message to the customer management system when an error has been detected while processing an SMS message. Active automatic alarm and error notification may be disabled at any time. If disabled the alarm and error messages will be logged but not sent.

5. Real-time clock (RTC)

The logging periodicity and the automatic data transmission are controlled by an integrated Real-Time Clock (RTC). Logged interval values will be marked by a date and time stamp.

If the Daylight Saving Time function is enabled, the system time will be automatically adjusted in accordance with the standard European UMT DST scheme.

The automatic RTC update function may be enabled providing synchronisation to GSM network time by a scheduled SMS message. The frequency of the update is configurable (once per day at maximum).

6. Infrared optical communication port

The infrared optical port is bi-directional and complies with EN 62056-21. It serves for local data read-out of the historic records for each channel and for local re-configuration of the unit during installation or maintenance. The maximum configurable data rate is 9600 bps.

Any local interrogation of the collected data must be made with equipment e.g. optical probes and hand-held units (HHU) certified for use in the hazardous area.

7. Enclosure

The P2G enclosure consists of a casing and a cover. Both are made of high durability self-extinguishing polycarbonate that can be recycled at the end of its lifetime.

A second cover is provided inside the enclosure, which prevents access to the electronic circuit while the unit is uncovered (e.g. at installation or battery replacement).

The cover of the unit features a circular recess with a metal ring for the positioning of the optical probe. Another rectangular recess is provided for the attachment (if needed) of an external aerial via a coupling module. A sealing mechanism is provided to prevent unauthorized removal of the aerial.

The unit cover is fastened to the casing with four screws. To prevent unauthorized entry, two wire seals are required. Sealing screws are located in upper right and lower left of the cover.
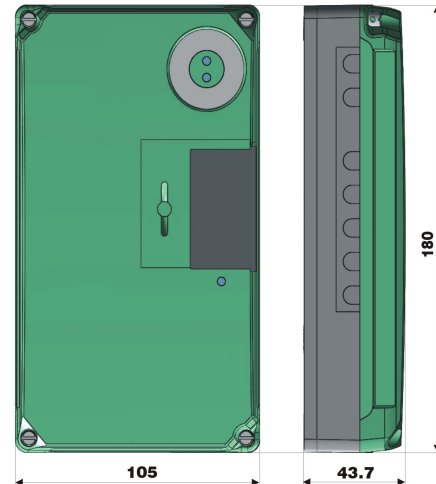

Fig 2. Unit dimensions

The enclosure is weatherproof and assures IP65 protection against dust and water penetration.

The device marking according to BS EN 12405 and the ATEX Directive is laser printed on the cover. Space is provided for any additional marking as required by the customer e.g. proprietary number and bar code.

8. Power supply

The P2G is powered by a factory supplied 3.9 V, size D lithium battery. Battery life is estimated to be in excess of 5 years assuming one SMS transmission per day. The remaining battery life expressed in mAh is stored in a register and is available remotely or over the optical port.

The battery can be easily replaced on site by authorized personnel. The electronic circuit of the unit is protected against reverse polarity installation of the battery. A temporary or lasting disconnection of the battery will not cause any loss of the stored data or unit settings.

The type of battery to be used is given on a label inside the battery compartment. The use of batteries other than those indicated is not permitted.

9. Installation & Comissioning

9.1. Mounting

The P2G can be mounted in any position – the correct operation of the unit is not position dependent.

In the preferred arrangement the P2G unit will be hung on a wall or any other base and additionally fixed by two fixing screws. Access to the fixing holes is possible only after the unit cover has been removed.
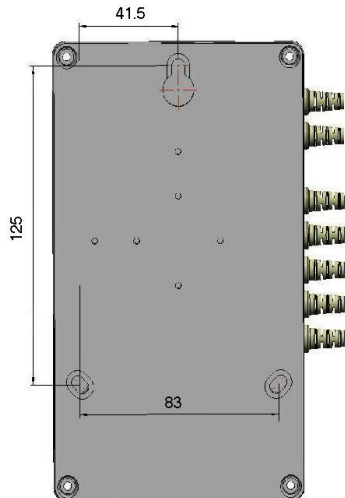

Fig. 3. Dimensions of the fixing triangle

The P2G unit is supplied with cables with flying leads 1 m in length for input and output connection. On request custom length cables can be supplied fitted with connectors according to the customer's specifications.

For the sealing of the unit cover conventional gas meter wire seals can be used.

9.2. Putting into operation

The P2G is normally supplied with the battery connected. By default the device remains in power-save mode. All registers will be set to factory defaults. All data and configuration registers are accessible via the infrared optical port.

Configuration and commissioning may be performed locally by authorized personnel using a HHU. Reprogramming of these parameters can be performed remotely at a later stage by SMS.

In both cases a system of four-level access passwords is provided to secure the stored data and configuration settings:

Level 1	Data readout of the logging device
Level 2	Setting of the date and time
Level 3	Configuration of the device
Level 4	Device reset

Once commissioned and operational the unit does not require further maintenance during the entire lifetime of the battery.

10. Certification

The P2G has been certified by the SIRA Certification Services, UK to be intrinsically safe according to the Directive 94/9/EC (ATEX Directive).
Certificate No.:

SIRA 04 ATEX 2394

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-20 ℃ ≤ T_a ≤ +60 ℃
(Zone 0)

11. Accessories

Upon request Iskraemeco's MeterView configuration software tool for unit programming and data read-out via the optical port of P2G may be supplied.

Infrared optical probes with a 9-pin connector can be supplied on request.
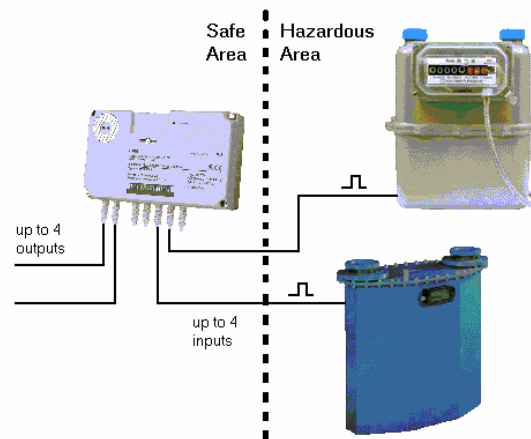
12. Typical application

Fig.4. Typical application of P2G

13. Technical data

No. of pulse inputs	4 max.
Max. sensor resistance (ON)	200 Ω
Min. sensor resistance (OFF)	500 kΩ
No. of OptoMOS relay outputs	4 max.
Output pulse width	5 ms
Switch-on resistance	< 10 Ω
Switch-off resistance	> 2 MΩ
Mutual channel isolation	2500 VDC
RTC accuracy	GSM Network Synchronised
Temperature logging accuracy	0.05 °C
EMC	EN 61000-6-2 EN 61000-6-3
RF electromagnetic field	10 V/m (0.1 - 1GHz)
Operating temperature range	-20° C … +60° C
Storage temperature range	-25° C … +75° C
Ambient humidity	<75% annual mean
Dimensions (W x H x D)	180 x 105 x 44 mm
Mass	approx. 0.40 kg

Table 1. Technical data

14. Device type designation

P2G-K171V03I01

P2	Communicator & Data Logger
G	Equipment for use with gas meters in potentially explosive environment
W	Equipment for use with water meters
K17	IR optical interface + GSM modem
1	RS485 interface
V03	Four pulse inputs
I01	Four OptoMOS relay outputs